

#19817 – 9/7/23

Identification and Overview**Thermobuffer Freezer/Cooler Sensor**

- Fluid-Filled Chamber Tracks Temperature of Freezer or Cooler Contents, Not Air Temperature, Decreasing False Alarms
- Easy Wall Mount or Wire Shelf Hanger
- Available with Extreme Temp Sensor for -328 to 32°F (-200 to 0°C)

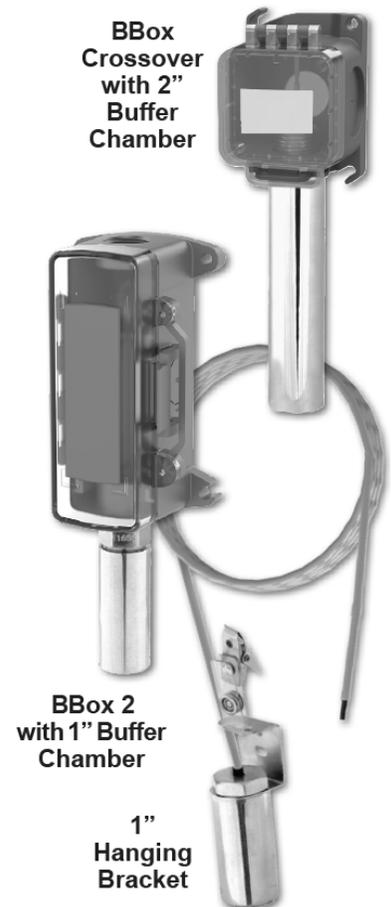
The Thermobuffer Temperature Sensor is used to simulate the refrigerator contents rather than the refrigerator air temperature. The fluid-filled chamber allows for slower reaction to abrupt temperature changes, yet still maintains long-term accuracy if the change remains permanent. It eliminates the temperature spikes due to frequent refrigerator or freezer door opening and decreases false alarms.

The Thermobuffer comes in three buffer sizes 1", 2" and 4" and is designed to save valuable shelf space by mounting to the wall or by hanger in a refrigerator or freezer. The buffer chamber is machined in 304 Stainless Steel or aluminum and accommodates a variety of temperature sensors or transmitters to interface with all BAS systems.

Part #s: **N1-10K-2-TB-M304-1-HB-BB2-25-A**
 N1-10K-2-TB-M304-1-HB-BB2-A
 N1-10K-2-TB-M304-1-HB-BB-A
 N1-10K-2-TB-M304-1-HB-NB-25-A
 N1-10K-2-TB-M304-2-BB-A
 N1-10K-2-TB-M304-2-HB-BB-25-A
 N1-10K-2-TB-M304-4-BB2-A
 N1-10K-2-TB-M304-4-BB-A

The BBox Crossover

The new BBox Crossover enclosure features a hinged cover with thumb latch for easy termination. A pierceable knockout plug is available for the open port. See the Accessories section for more info. (Shown with knockout plug sold separately.)



Specifications**Sensor:** Passive

Thermistor..... NTC, 2 Wire
 RTD PTC, 2 or 3 Wire

Thermistor:

Temp. Output Resistance
 Accuracy (Std) $\pm 0.36^{\circ}\text{F}$, ($\pm 0.2^{\circ}\text{C}$)
 Accuracy (High) $\pm 0.18^{\circ}\text{F}$, ($\pm 0.1^{\circ}\text{C}$)
 Stability $< 0.036^{\circ}\text{F}/\text{Year}$, ($< 0.02^{\circ}\text{C}/\text{Year}$)
 Heat dissipation $2.7 \text{ mW}/^{\circ}\text{C}$
 Temp. Drift $< 0.02^{\circ}\text{C}$ Per Year
 Probe range -40° to 221°F (-40° to 105°C)

RTD: Platinum 1K, 1K[375], 1K[A]

1K $1\text{K}\Omega$ @ 0°C , $3.85\Omega/^{\circ}\text{C}$ Curve
 1K[375] $1\text{K}\Omega$ @ 0°C , $3.75\Omega/^{\circ}\text{C}$ Curve
 1K[A] $1\text{K}\Omega$ @ 0°C , $3.85\Omega/^{\circ}\text{C}$ Curve, High Accuracy RTD
 Accuracy 0.12% @Ref, or $\pm 0.55^{\circ}\text{F}$, ($\pm 0.3^{\circ}\text{C}$)
 Accuracy 1K[A] 0.06% @Ref, or $\pm 0.277^{\circ}\text{F}$ ($\pm 0.15^{\circ}\text{C}$)
 Range -40° to 221°F , (-40 to 105°C)

RTD: Extreme Temperature Platinum 1K[1]

1K[1] $1\text{K}\Omega$ @ 0°C , 385 Curve
 Range -328° to 32°F , (-200 to 0°C)

RTD: Nickel 1K[NI]

1K[NI] $1\text{K}\Omega$ @ 70°F , $2.95\Omega/^{\circ}\text{F}$ JCI Curve
 Range -40° to 221°F (-40 to 105°C)

RTD: All RTDs

Stability $\pm 0.25^{\circ}\text{F}$, ($\pm 0.14^{\circ}\text{C}$)
 Self Heating $0.4 \text{ }^{\circ}\text{C}/\text{mW}$ @ 0°C

Wire: 22 AWG Stranded, 2 or 3 Wires**Insulation:** Etched Teflon or FEP-Jacketed; PTFE for 1K[1]**Wiring to Probe:**

1K[1] Extreme Temp Probe - PTFE Jacketed Cable

Probe: 304 Stainless Steel (SS), 0.25" OD**Probe Process Connection:**

304 SS Double threaded $\frac{1}{2}$ " NPT

Probe Length: Probe tip to thread start

1" 0.75"
 2" 3.5"
 4" 5.5"

Buffer Chamber Dimensions:

1" Buffer $2.75"$ H x $1"$ Dia
 2" Buffer $5.1"$ H x $1"$ Dia
 4" Buffer $7.1"$ H x $1"$ Dia

Liquid Fill: Food Grade Glycol (Customer provided)

1" Buffer 5 mL
 2" Buffer 20 mL
 4" Buffer 30 mL

Buffer Chamber Construction:

M304 Machined 304 Stainless Steel, 0.7" core
 MAL Machined Aluminum, 0.7" core

Mounting:

BBoxes 4 extension tabs (ears), $7/16"$ hole
 Hanging Bracket .. SS bracket w/ $1/8"$ holes or $3/8"$ spring clip Enclosure Type:
 No Box Intended for direct $\frac{1}{2}"$ NPT pipe mount
 BBox Four $\frac{1}{2}"$ NPSM ports & one $\frac{1}{2}"$ drill-out
 BBox2 Three $\frac{1}{2}"$ NPSM ports & three $\frac{1}{2}"$ drill-outs
 Hanging Bracket .. Intended to hang from shelving

Enclosure Rating:

No Box No rating
 BBoxes NEMA 4, IP66
 Hanging Bracket .. No rating

Enclosure Material:

BBoxes Polycarbonate, UL94V-0, UV rated
 Hanging Bracket .. 304 Stainless Steel bracket and clip

Environmental Op.

Range: 0 to 100% RH, Non-condensing

Standard Temp Sensor Units:

BBox and BBox 2: .. -40°F to 185°F (-40° to 85°C)
 No Box: -40°F to 212°F (-40° to 100°C)
 Hanging Bracket: .. -40°F to 122°F (-40° to 50°C)
 Temp Transmitter Units: -4 to 158°F (-20 to 70°C)
 Extreme Temp Sensor Units: -328 to 32°F (-200 to 0°C)

Agency:

RoHS, CE (Thermistors $10\text{K}\Omega$ or smaller) Pt=
 DIN43760, IEC Pub 751-1983, JIS C1604-1989

Dimensional Drawing

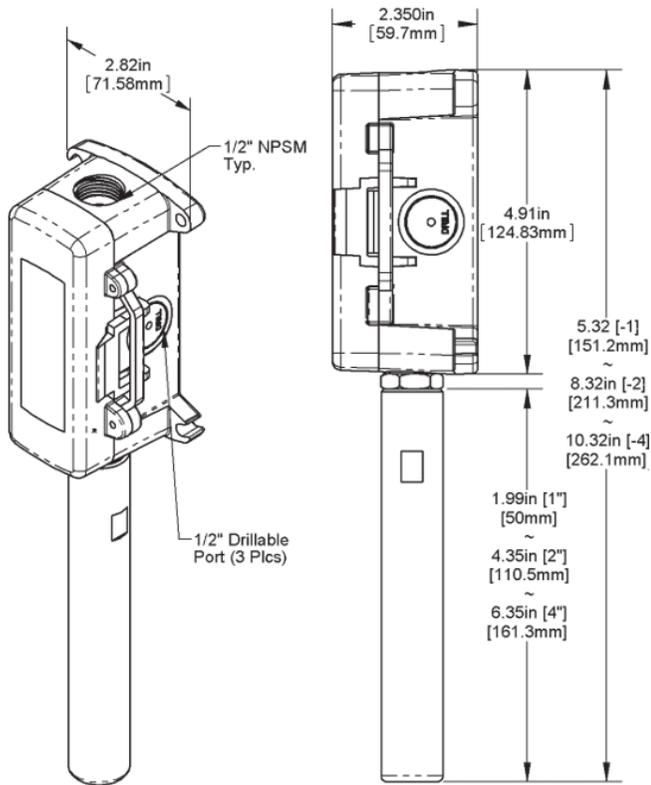


Figure 1: BBox 2 (BB2) Enclosure

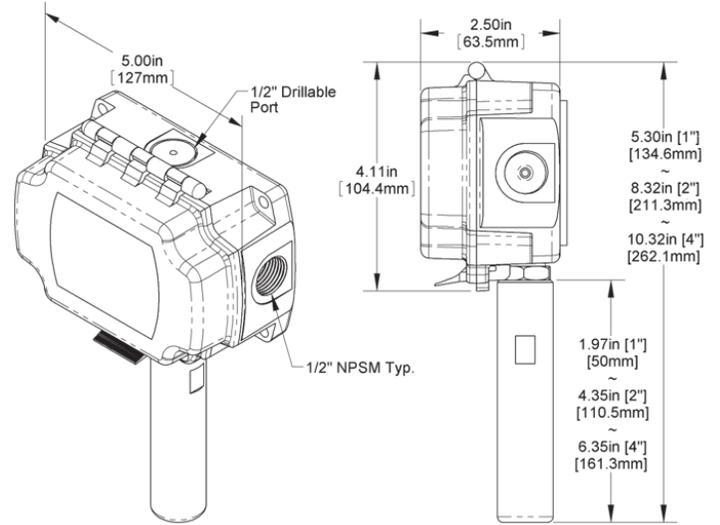


Figure 2: BBox (BB) Enclosure

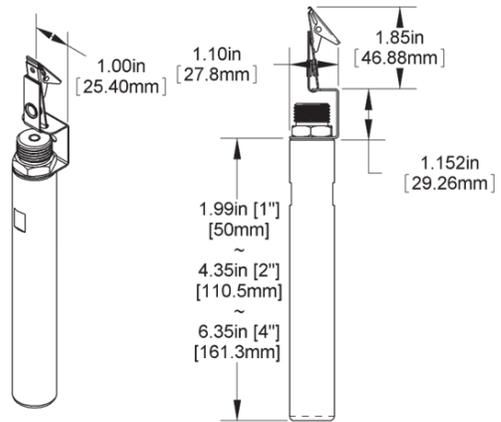


Figure 3: Hanging Bracket

Thermobuffer Freezer/Cooler Sensor Option Selection

Use the Option Selection Guide below to create your custom part number. Replace the number and parenthesis with the designator for each selection. Skip the designator and dashes for optional selections that are not required in your configuration.

<p>N1- (#1) - (#2) - (#3) - (#4) - (#5) - (#6) -A</p> <p>#1: Temp Sensor (required)</p> <p>1.8K 1.8K Thermistor</p> <p>3K 3K Thermistor</p> <p>10K-2 10K-2 Thermistor</p> <p>10K-3 10K-3 Thermistor</p> <p>10K-3[11K] 10K-3[11K] Thermistor</p> <p>20K 20K Thermistor</p> <p>1K[375] 1K Plat. RTD (375 curve)</p> <p>1K[Ni] 1K Ω Nickel RTD</p> <p>1K 1K Plat. RTD (385 curve)</p> <p>1K[1] 1K Plat. RTD, Extreme Temp, -328 to 32°F (-200 to 0°C), PTFE Insulation Leads</p> <p>1K Plat. RTD Transmitters below with 4 to 20 mA Output - require a BBox2 Enclosure</p> <p>T1K[32 TO 212F] ... 32 to 212°F Range</p> <p>T1K[20 TO 120F] ... 20 to 120°F Range</p> <p>T1K[0 TO 100F] 0 to 100°F Range</p> <p>T1K[0 TO 100C] 0 to 100°C Range</p> <p>T1K[-7 TO 49C] -7 to 49°C Range</p> <p>T1K[-18 TO 38C] -18 to 38°C Range</p> <p>Additional options are available for these units but not shown in this Selection Guide. Contact your representative for the complete list of options.</p>	<p>#2: Buffer Material and Length (required)</p> <p>TB-M304-1 1" 304 SS Buffer (Overall length 1.9")</p> <p>TB-M304-2 2" 304 SS Buffer (Overall length 4.3")</p> <p>TB-M304-4 4" 304 SS Buffer (Overall length 6.3")</p> <p>TB-MAL-2 2" Aluminum Buffer (Overall length 4.3")</p> <p>TB-MAL-4 4" Aluminum Buffer (Overall length 6.3")</p> <p>#3: Hanging Bracket Mounting (optional)</p> <p>HB Hanging Bracket (30" FEP-Jacketed Cable)</p> <p>#4: Enclosure Style (required)</p> <p>BBX BBox Crossover (IP10, NEMA 1)</p> <p>BB2 BBox2 (IP66, NEMA 4X)</p> <p>NB No Box</p> <p>#5: Custom Lead Length (for HB and No Box units)</p> <p>5 5' of FEP-Jacketed Cable</p> <p>10 10' of FEP-Jacketed Cable</p> <p>25 25' of FEP-Jacketed Cable</p> <p>#6: Test & Bal. or Terminal Strip (optional)</p> <p>TB Test & Balance Switch</p> <p>TS Terminal Strip Connection</p>
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Example Number:

N1- (10K-2) - (TB-M304-1) - () - (BBX) - () - () = N1/10K-2-TB-M304-1-BBX-A

Description: 10K-2 Thermistor, Thermobuffer, 1" 304SS Buffer, BBox Crossover Enclosure.

Mounting

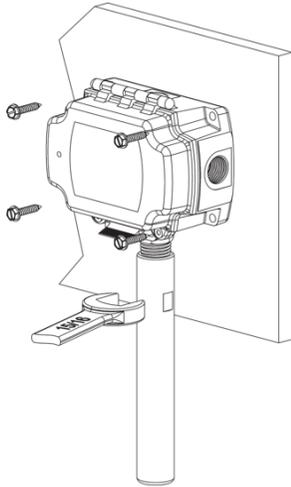


Figure 4: BBox (BB) Enclosure Installation

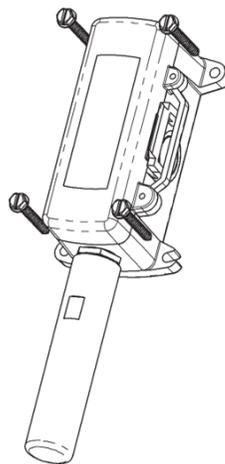


Figure 5: BBox2

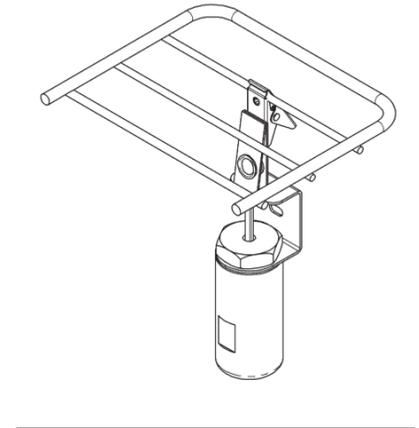


Figure 6: Hanging Bracket Rack Installation

1. Fill the buffer chamber with the appropriate amount of customer provided glycol to the amount as dictated by table 1.
2. Wrap the probe threads with Teflon tape with at least 4 wraps so a watertight seal is established.
3. Insert the probe into the buffer chamber and screw in for a secure watertight fit.
4. Towel off excess fluid which may leak out during assembly and check for leaking. If the assembly leaks, a 15/16ths wrench may be used to snug up the probe to the buffer chamber. More tape may also be needed. The use of food safe silicon may also be used.
5. Select a location on a wall or hanging from a wire rack near the contents you wish to monitor.
6. Mount the thermbuffer with the buffer chamber facing down (Probe on top). Any other orientation is not recommended due to leaking concerns.
7. We recommend BBox surface mounting be positioned over the refrigerator wireway hole using the rear BBox knock out. Pull the wiring into the unit and terminate using sealant filled connectors. Best practice is to caulk the wiring hole after the wiring is installed. Secure with mounting screws and ensure that the foam backing compresses to about 50% of its thickness to make a gasket type seal against the surface.

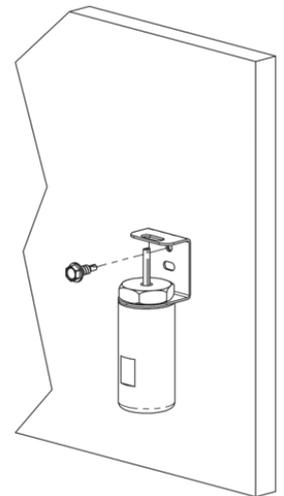


Figure 7: Hanging Bracket Wall Installation (Customer Provided Screws)

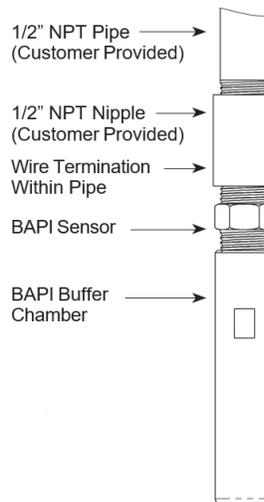


Figure 8: No Box (NB)

Table 1:	
Buffer Size	Recommended Fluid Fill
1" Buffer	0.17 Fluid oz (5mL)
2" Buffer	0.67 Fluid oz (20mL)
4" Buffer	1.00 Fluid oz (30mL)

Wiring and Termination

All wiring must comply with the National Electric Code (NEC) and local codes.

 Caution	<p>Do NOT run this device's wiring in the same conduit as high or low voltage AC power wiring. Tests show that inaccurate signal levels are possible when AC power wiring is present in the same conduit as the sensor wires.</p>
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 Tip	<p>We recommend using twisted pair of at least 22AWG and sealant filled connectors for all wire connections. Larger gauge wire may be required for long runs</p>
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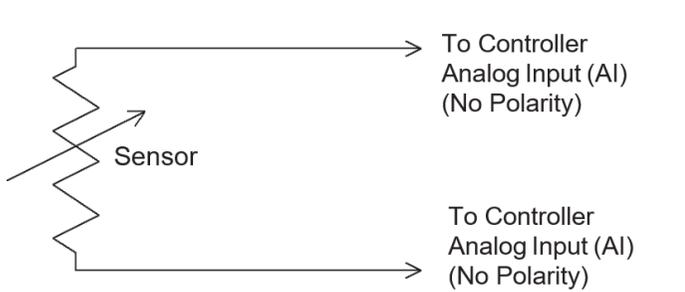


Figure 9: Two Wire Termination for Thermistor or RTD

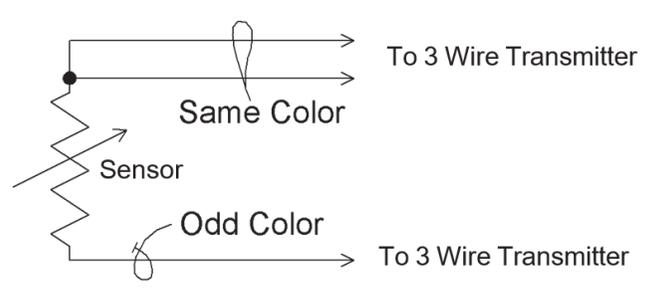


Figure 10: Three Wire Termination for RTD

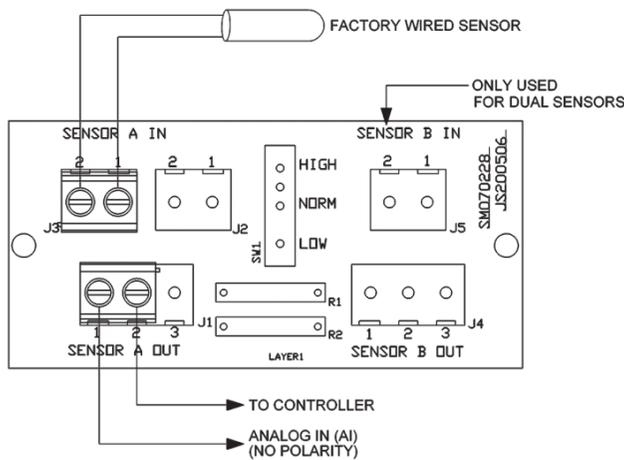


Figure 11: Terminal Strip (-TS) Option for Two

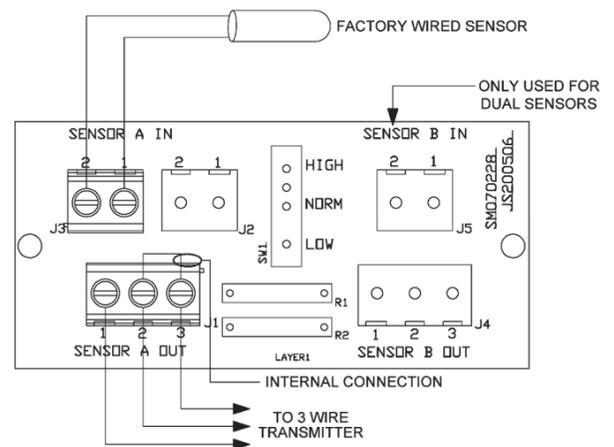


Figure 12: Terminal Strip (-TS) Option for Three Wire Sensor Termination

#19817 – 9/7/23

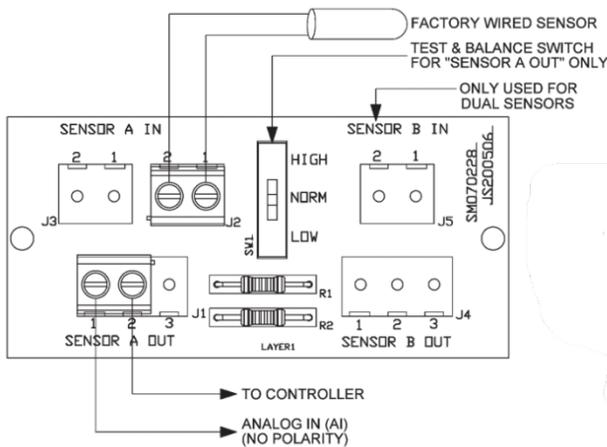


Figure 13: Test & Balance (-TB) Option for Two Wire Sensor Termination

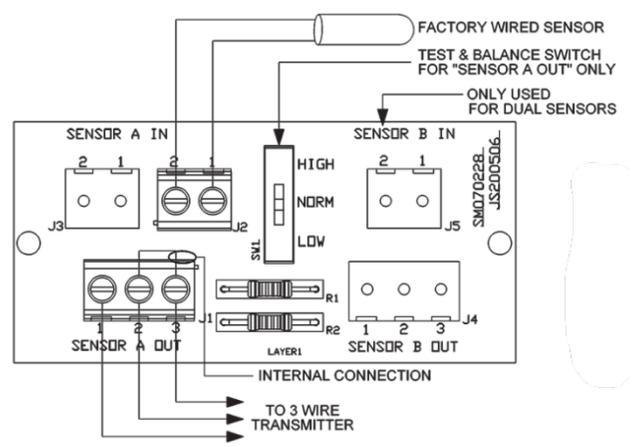


Figure 14: Test and Balance (-TB) Option

Test and Balance Switch:

For units with a Test and Balance Switch, the Norm position allows the real sensor at be monitored at “Sensor A Out”. The High position forces the “Sensor A Out” to a very hot reading and the Low position forces “Sensor A Out” to a very cold reading (see Table at right).

Sensor Type	Low Temp (40° F) Resistance Value	High Temp (105° F) Resistance Value
1000Ω RTD	1.02KΩ (41.20°F)	1.15KΩ (101.5°F)
3000Ω Thermistor	7.87KΩ (39.8°F)	1.5KΩ (106.8°F)
10K-2 Thermistor	30.1KΩ (34.9°F)	4.75Ω (109.1°F)
10K-3 Thermistor	26.7KΩ (35.9°F)	5.11KΩ (108.4°F)
10K-3(11K) Thermistor	7.32KΩ (43.7°F)	3.65Ω (105.2°F)

Diagnostics	
Possible Problems:	Possible Solutions:
Controller reports higher or lower than actual temperature	<p>Confirm the input is set up correctly in the front end software</p> <p>Check wiring for proper termination & continuity (shorted or open)</p> <p>For units with a Test & Balance Switch, verify that it is in the center position.</p> <p>Disconnect wires and measure the sensor resistance and verify that the sensor resistance is correct as compared to the temperature/resistance table for that sensor.</p>

Appendix – Symbols Key

 Warning	Potential for death, serious injury, or permanent damage to a system.
 Caution	Potential for injury, damage to a system, or system failure.
 Tip	Useful information not related to injury or system damage.